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(54) Spreads having a good microbiological stability and a fresh dairy taste.

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### Description

The present invention relates to spreads having a good microbiological stability, by which term is meant that the spreads have a long shelf life, i.e. 6 weeks or longer at 10 °C, without displaying deterioration due to growth of microorganisms.

The present invention particularly relates to oil- and water-containing spreads with a fresh dairy taste, which contain milk protein dispersed or dissolved in an aqueous phase having a pH lower than 6.0 and preferably ranging from 4.0 to 5.8.

A low pH largely contributes to the microbiological stability of the product and is therefore desirable.  
However, a disadvantage associated with spreads having such low pH's is that they taste sour.

US 4 227 981 relates to ice-cream and discloses the preparation by electrodialysis of demineralised and deacidified acid whey so as to obtain a final product with a maximum pH of about 6.0 and titratable acidity of roughly equivalent to 40 milli-equivalent acid/kilogram. While it is suggested in that citation that the product may be used in ice-cream production there is no suggestion that the product may be used in spreads.

It is therefore an object of the present invention to provide w/o and o/w emulsion spreads which do not taste to acidic although their pH is within the above range.

It is another object of the present invention to provide butter-like spreads, particularly w/o emulsion spreads, which display good flavour release properties and a good stability both at ambient temperatures and at refrigerator temperatures.

Applicants have found edible, oil- and water-containing spreads meeting the above desiderata. Said spreads are characterized in that they comprise a fat phase and an aqueous phase of a pH not exceeding 6.0, which aqueous phase comprises:

less than 40 milli-equivalent acid/kg.

25 diacetyl at a level of 1-40 mg/kg.

calcium at a level of 0.720 mg/kg.

magnesium at a level of 0-20 mg/kg.

said aqueous phase being the product obtained by

39 a) souring milk or a milk product with a bacterial culture productive of diacetyl or precursors thereof, and,  
b) electrodialysing the milk or milk product to remove minerals and acid therefrom.

By milk or milk product we understand whole milk, skimmilk, whey, butter serum or concentrates thereof, including membrane-filtered milk, buttermilk, cream, yoghurt, cheese and quark, which may optionally further contain flavouring agents, e.g. sugar or cocoa, and preservatives.

35 By demineralisation and deacidification we do not necessarily mean that all the acid and all the salt originally present in the starting material are removed, but rather that the milk or milk products are treated such that they contain less than 80 weight % and preferably from 0.5-70 weight % of the original amount of acid and salt. A reduction of 90 weight % or more of the original amount of acid and salt is ideal, but is more time-consuming.

40 Deacidification/demineralisation is carried out for a period of time long enough to obtain a milk or milk product which can be used as the aqueous phase of the emulsions according to the invention, which phase contains less than 40 milli-equivalent acid/kg and preferably 1-25 milli-equivalent acid/kg.

**Demineralisation of the milk product is preferably carried out for a period of time long enough to obtain**

Electrodialysis is generally carried out at a temperature ranging from 0-35 °C. The higher temperatures contribute to a less time-consuming process, whereas the lower temperatures help avoiding coagulation of the protein, bacteriological problems and clogging of the membranes. Electrodialysis is therefore preferably carried out between 0 and 20 °C and ideally between 5 and 15 °C.

5 Applicants have found it very appropriate to homogenize the milk product prior to the demineralisation treatment, in order to achieve a better dispersion/solubilization of the protein and to avoid clogging of the membranes.

Homogenization is preferably carried out under pressure, for instance at 100-200 bars.

10 The edible spreads according to the invention preferably comprise an aqueous phase containing deacidified, demineralised, biologically soured milk or milk product, since such greatly contributes to butter-likeness, a fine precipitate of the protein, generation of antimicrobial factors and a reduction of the lactose content resulting in a reduced sweetness.

The aqueous phase of the emulsions of the present invention are obtainable according to a process comprising in its most general form:

15 (1) acidifying milk or a milk product from whole milk, skimmilk, whey, buttermilk and butter serum or concentrates thereof by applying bacteriological souring and/or by adding an acid or an acid-generating substance, such as glucono delta-lactone to achieve a pH lower than 5.8 and preferably ranging from 2.5-5.5; and

20 (2) subjecting the acidified milk product to a demineralisation/deacidification treatment to obtain a product having a pH lower than 5.8 and preferably ranging from 4.0-5.8 and containing less than 40 meq acid/kg.

More specifically, there are two ways of performing the process outlined above.

A first method comprises:

25 (1) acidifying milk or a milk product with an acid or an acid-generating substance to achieve a pH below 5.5,

(2) subjecting the acidified milk or milk product to a demineralisation/deacidification treatment,

(3) if necessary, adding an alkaline substance to raise the pH to a value above 5.5 and preferably to a value ranging from 5.8-6.8, and, if necessary, pasteurizing the mixture;

(4) achieving bacteriological souring of the mixture.

30 The advantage associated with this method lies in the excellent texture of the products obtained according to this method.

A second method comprises:

(1) bacteriologically souring milk or a milk product and subsequently

35 (2) subjecting the bacteriologically soured milk or milk product to a demineralisation/deacidification treatment.

Bacteriological souring is preferably carried out with a culture selected from Streptococcus lactis, Streptococcus cremoris, Streptococcus diacetylactis, Leuconostoc cremoris, Leuconostoc mesenteroides, Streptococcus citrophilus, Streptococcus thermophilus, Lactobacillus bulgaricus, Lactobacillus acidophilus, Bifidobacterium bifidus, Bifidobacterium infantis, Lactobacillus helveticus, Lactobacillus casei and *Pro-pionibacterium shermanii*.

The preferred cultures consist of Streptococcus diacetylactis, Leuconostoc cremoris, Streptococcus cremoris or of mixtures thereof, which generate a high amount of diacetyl.

Applicants have also found that it is very useful, during or after the bacteriological souring, to aerate, preferably under pressure, the milk or milk product in order to increase the level of diacetyl.

45 Another way of achieving this consists in heating the mixture to a temperature ranging from e.g. 50-90 °C.

Still another way of achieving a high level of acetyl consists in fermenting the mixture and optionally adding an extra amount of acid, e.g. lactic acid, hydrochloric acid or citric acid, to achieve a pH ranging from 1.0 to 4.5 and preferably from 2.0 to 3.0.

50 Such treatment can be combined with a subsequent aeration or a heat treatment or with both aeration and a heat treatment.

Such treatments for enhancing diacetyl production turned out to be extremely useful in avoiding losses of diacetyl during electrodialysis, ultimately leading to loss of flavour.

The demineralized, deacidified milk products produced as described above can be further concentrated by evaporation, reverse osmosis, ultrafiltration, heating between 35 and 85 °C, isolectric precipitation followed by separation or filtration, or combinations of these techniques, to obtain cheese, quark, etc., which can be used as components of the dispersed aqueous phase of the w/o emulsion spreads of the present invention.

The aqueous phase of the edible spreads according to the invention may contain viscosity-increasing agents, such as thickening agents and gelling agents, for instance CMC, guar gum, carragheenan, locust bean gum, xanthan gum, starch and gelatin.

Such substances improve the stability and texture of the product during storage at ambient temperature and at refrigerator temperature.

The preferred gelling agent consists of gelatin, starch or mixtures thereof, which impart stability during storage and spreading of the spread and enhance release of flavours during consumption particularly of w/o emulsion spreads since they contribute to coarsening the dispersed aqueous phase and to breaking of the emulsion on consumption.

10 The starch is preferably selected from the group consisting of rice starch, oat starch, corn starch, wheat starch, di-starch phosphate, acetylated di-starch adipate, hydroxypropyl di-starch phosphate and acetylated di-starch phosphate.

Suitable concentrations of gelatin range from 0.5-5%, preferably from 1 to 3%.

15 Suitable concentrations of starch range from 1-5%, preferably from 1.5-4% by weight, based on the total spread.

It is envisaged that the emulsions should be produced by emulsification of the aqueous phase with a fat phase in a way known per se, for instance by such methods as are described in Chapter 3 of "Margarines", by A. Anderson and P. Williams, 2nd revised edition, Pergamon Press, London, 1965.

20 The fat phase can comprise vegetable fats and animal fats. Such fats can be hydrogenated, interesterified or fractionated.

For organoleptic and economic reasons, mixtures of vegetable fats and butter fat are preferred.

Vegetable fats may comprise maize oil, soybean oil, rapeseed oil, sunflower oil, palm oil, coconut oil, palmkernel oil, babassu oil, in their natural form or in randomized or fractionated form.

25 The most appropriate mixture of fats will depend on the nature of the final product aimed at. Very suitable plastic fat blends for spreads of the margarine and reduced fat products with a level of fat ranging from 20-90%, preferably 30-65%, can be found in the above reference book, "Margarines".

The invention will now be illustrated in the following Examples.

Example 1

30 Milk was pasteurized for 5 minutes at 90 °C and was subsequently cooled to 20 °C.

The milk was innoculated with a commercially available culture containing Streptococcus diacetylactis, Leuconostoc cremoris and Streptococcus cremoris and fermented overnight to obtain soured skimmilk of pH = 4.50.

35 The fermented milk was subsequently homogenized at 150 bars.

The fermented milk was electrodialysed in an EQUALIZER PIO produced and marketed by SRTI (FRANCE), equipped with 30 cell pairs anionic and cationic membranes (type Selemion from ASAHI, Japan).

40 Electrodialysis was carried out for one hour at 30 °C at a voltage of 1.5 V per cell pair. Samples were taken to check acidity, conductivity and diacetyl content. After one hour the conductivity had decreased from about 1.8 mS to about 0.04 mS. The pH decreased slightly to 4.4. Titration of the milk to neutrality, using sodium hydroxide, indicated that the titratable acid content decreased from about 81 milliequivalent/kg to about 24 milliequivalent/kg.

The product contained after electrodialysis about 2.5 mg/kg diacetyl.

45 Analysis of the milk product before and after electrodialysis revealed the following composition:

	<u>before</u>	<u>after</u>
5	1267 mg K/kg	7 mg K/kg
	362 mg Na/kg	12 mg Na/kg
	923 mg Ca/kg	2 mg Ca/kg
	120 mg Mg/kg	15 mg Mg/kg
10	1000 mg Cl <sup>-</sup> /kg	50 mg Cl <sup>-</sup> /kg
	900 mg P/kg	300 mg P/kg*
	300 mg citrate/kg	100 mg citrate/kg
	8400 mg lactate/kg	120 mg lactate/kg

15

(\* total of organic + inorganic phosphorus)

20 A reduced fat, w/o emulsion spread of the following composition was produced:

	<u>Fat phase</u>	<u>% by weight</u>
25	Butterfat	20
	Vegetable fat*	20
	Lecithin	0.1
	Beta-carotene	0.15
30	Monoglyceride	0.2

Aqueous phase (pH 4.7)

35	Salt	0.35
	Potassium sorbate	0.13
	Gelatin	2.0
	Rice starch	2.5

40 Electrodialysed cultured milk (q.s.p) up to 100%.

The spread was produced by emulsification of the aqueous phase and the fat phase in a Votator® in the conventional way.

45 \*\* The vegetable fat consisted of a 20/80 mixture of palm oil hydrogenated to a melting point of 43°C and soybean oil.

55 Example 2

Example 1 was repeated, using buttermilk as the starting material. The procedure was identical with that of Example 1, though the fermented milk was aerated by vigorously stirring it for 2 hours and was

subsequently homogenized at 100 bars.

During 1 hour electrodialysis the electric conductivity decreased from 1.7 mS to 0.13 mS. The pH increased from 4.5 to 4.6. The titratable (to neutrality) amount of acid decreased from about 88 milli-equivalent/kg to about 23 milli-equivalent/kg. The amount of lactic acid decreased from 7500 mg/kg to 100 mg/kg.

The diacetyl content before and after electrodialysis was about 5.0 mg/kg. Analysis of the electrodialysed buttermilk revealed the following composition:

10	Calcium	2	mg/kg
	Magnesium	32	mg/kg
	Potassium	8.4	mg/kg
15	Sodium	3.2	mg/kg
	Phosphorus	400	mg/kg
	(organic + inorganic)		
	Citrate	0	mg/kg
20	Chloride	50	mg/kg

A reduced fat spread of the same composition as in Example 1 was produced, except that electrodialysed cultured buttermilk was used instead of electrodialysed cultured milk.

25 The results of the panel were as satisfactory as in the case of Example 1.

#### Example 3

Example 1 was repeated to produce a margarine.

30 The composition of the margarine was:

	<u>Fat phase</u>	<u>% by weight</u>
35	Butterfat	40
	Vegetable fat	40
	Lecithin	0.1
40	Beta-carotene	0.15
	Monoglyceride	0.2

#### Aqueous phase (pH 4.7)

45	Salt	0.35
	Potassium sorbate	0.13

**Electrodialysed cultured milk (q.s.p) up to 100%.**

50 The results of the panel were very satisfactory.

#### Example 4

55 The electrodialysed, soured milk pH 4.4 of Example 1 was slowly heated to about 35°C and the coagulate was subsequently heated at 55°C and filtrated to obtain a cheese resembling cottage cheese.

This cottage cheese was mixed with butter (weight ratio 70/30) in a Hobart mixer to obtain a spread.

The spread was given to a panel of consumers who judged the flavour of the product. The flavour of the

product was found very satisfactory, free of acidic taste.

Various modifications may be made to the process without departing from the scope of this application. For example, churning or other such processes may lead to a multiplex emulsion in which a large proportion of the continuous phase is held in dispersed form. It is intended that the terms water-in-oil emulsion and oil-in-water emulsion shall include those structures where the continuous phase is in part dispersed and/or the dispersed phase is semi-continuous.

**Claims**

**Claims for the following Contracting States: BE, CH, LI, DE, ES, FR, GB, GR, IT, NL, SE**

- 10 1. Edible, oil- and water-containing emulsion spread comprising a fat phase and an aqueous phase of a pH not exceeding 6.0, which aqueous phase comprises:  
less than 40 milli-equivalent acid/kg,  
diacetyl at a level of 1-40 mg/kg,  
calcium at a level of 0-720 mg/kg,  
magnesium at a level of 0-20 mg/kg,  
said aqueous phase being the product obtained by:
  - a) souring milk or a milk product with a bacterial culture productive of diacetyl or precursors thereof, and,
  - b) electrodialysing the milk or milk product to remove minerals and acid therefrom.
- 15 2. Edible spread according to claim 1, wherein the milk or milk product is selected from the group consisting of whole milk, skimmilk, whey, buttermilk, butter serum and concentrates thereof, including membrane-filtered milk, buttermilk, cream, yoghurt, cheese and quark, optionally containing flavouring agents and preservatives.
- 20 3. Edible spread according to claim 1, wherein the pH of the aqueous phase ranges from 4.0 to 5.8.
4. Edible spread according to claim 1, wherein the aqueous phase contains 1-25 milli-equivalent acid/kg.
- 25 5. Edible spread according to claim 1, wherein the aqueous phase contains a demineralised, deacidified milk or milk product containing less than 80% and preferably 0.5-70% of the amount of acid and salt present in the corresponding non-demineralised milk or milk product.
- 30 6. Edible spread according to claim 1, wherein the aqueous phase comprises:

0-950,	and preferably 0-350 mg potassium/kg
0-500,	and preferably 0-150 mg sodium/kg
40 0-250	mg calcium/kg
0-20	mg magnesium/kg
0-800,	and preferably 0-200 mg chloride/kg
45 0-800,	and preferably 0-600 mg phosphorus/kg (organic + inorganic)
0-1000,	and preferably 0-400 mg citrate/kg, and
50 0-10000,	and preferably 0-2500 mg lactate/kg.

7. Demineralised and deacidified milk or milk product according to claim 1, wherein the bacterial culture is selected from *Streptococcus lactis*, *Streptococcus diacetylactis*, *Streptococcus cremoris*, *Streptococcus aromaticus*, *Streptococcus citrophilus*, *Bacillus cremoris*, *Leuconostoc citrovorum*, *Leuconostoc cremoris*, *Lactobacillus helveticus*, *Lactobacillus casei* and *Propionibacterium shermanii*.
8. Edible spread according to claim 7, wherein the bacterial culture is a mixture of *Streptococcus*

diacetylactis, Leuconostoc cremoris and Streptococcus cremoris.

9. Edible spread according to claim 1, wherein the aqueous phase contains a component selected from the group comprising a thickening agent, a gelling agent and a mixture of both gelling and thickening agent.  
5
10. Edible spread according to claim 9, wherein the aqueous phase contains gelatin.
11. Edible spread according to claim 9, wherein the aqueous phase contains non-crystalline hydrated starch.  
10
12. Edible spread according to claim 11, wherein the starch is selected from the group consisting of rice starch, oat starch, corn starch, wheat starch, di-starch phosphate, acetylated di-starch adipate, hydroxypropyl di-starch phosphate and acetylated di-starch phosphate.  
15
13. Edible spread according to claim 1, wherein the aqueous phase constitutes 10-80%, preferably 40-70% by weight of the total spread and the fat phase constitutes 20-90%, preferably 30-65% by weight of the total spread.  
20
14. Edible spread according to claim 1, wherein the fat phase contains butterfat and preferably a mixture of butterfat and a vegetable fat.  
25
15. Edible spread according to claim 1, wherein the spread consists of a water-in-oil emulsion.

26 **Claims for the following Contracting State: AT**

1. A process for the production of the aqueous phase of a demineralised and deacidified water and oil-containing spread, characterised in that the said process includes the steps of:
  - a) acidifying milk or a milk product by fermentation with a bacterial culture productive of diacetyl or precursors thereof, and,  
30
  - b) electrodialysing the milk or milk product to remove minerals and acid therefrom,  
so as to obtain a demineralised and deacidified aqueous phase comprising less than 40 milli-equivalent acid/kg, diacetyl at a level of 1-40 mg/kg, calcium at a level of 0-720 mg/kg, and, magnesium at a level of 0-20 mg/kg.  
35
2. A process according to claim 1, wherein the pH achieved ranges from 4.0 to 5.8.  
40
3. A process according to claim 1, wherein the acid content achieved ranges from 1-25 milli-equivalent acid/kg.  
45
4. A process according to claim 1, wherein the achieved acid and salt content is less than 80% and preferably 0.5-70% of the amount of acid and salt present in the corresponding non-demineralised milk or milk product.
5. A process according to claim 1, wherein the aqueous phase comprises:  
50

0,950, and preferably 0-350 mg potassium/kg  
0-500, and preferably 0-150 mg sodium/kg  
0-250 mg calcium/kg  
0-20 mg magnesium/kg  
0-800, and preferably 0-200 mg chloride/kg  
55

0-800, and preferably 0-600 mg phosphorus/kg  
(organic + inorganic)

5 0-1000, and preferably 0-400 mg citrate/kg, and  
0-10000, and preferably 0-2500 mg lactate/kg.

10 6. A process according to claim 1, which further comprises the step of souring the milk or milk product with a bacterial culture containing one or more of *Streptococcus lactis*, *Streptococcus diacetylactis*, *Streptococcus cremoris*, *Streptococcus aromaticus*, *Streptococcus citrophilus*, *Betacoccus cremoris*, *Leuconostoc citrovorum*, *Leuconostoc cremoris*, *Lactobacillus helveticus*, *Lactobacillus casei* and *Propionibacterium shermanii*, preferably a mixture of *Streptococcus diacetylactis*, *Streptococcus cremoris* and *Leuconostoc cremoris*.

15 7. A process according to claim 6, which further comprises the step of aerating the milk or milk product.

20 8. A process according to claim 1, wherein the milk or milk product is selected from the group comprising whole milk, skimmilk, whey, buttermilk, butter serum and concentrates thereof, including membrane-filtered milk, buttermilk, cream, yoghurt, cheese and quark, optionally containing flavouring agents and preservatives.

25 9. A process for the production of an edible water-and oil-containing spread, characterised in that the said process includes the process steps of claim 1 and emulsification of the aqueous phase with a fat phase.

30 10. A process according to claim 9, in which the aqueous phase constitutes 10-80%, preferably 40-70% by weight of the total spread.

35 11. A process according to claim 9, in which the fat phase contains butterfat and preferably a mixture of butterfat and a vegetable fat.

**Revendications**

35 **Revendications pour les Etats contractants suivants: BE, CH, LI, DE, ES, FR, GB, GR, IT, NL, SE**

1. Produit à tartiner comestible contenant de l'huile et de l'eau, qui comprend une phase grasse et une phase aqueuse dont le pH ne dépasse pas 6,0, phase aqueuse qui comprend moins de 40 meq d'acide par kg.

40 du diacétyle à raison de 1 à 40 mg/kg, du calcium à raison de 0 à 720 mg/kg, du magnésium à raison de 0 à 20 mg/kg, ladite phase aqueuse étant le produit qu'on obtient par un procédé consistant :  
(a) à faire surir du lait ou un produit laitier à l'aide d'une culture bactérienne produisant du diacétyle ou des précurseurs de celui-ci et  
(b) à électrodialysier le lait ou le produit laitier pour en éliminer les matières minérales et l'acide.

45 2. Produit à tartiner comestible selon la revendication 1, dans lequel le lait ou le produit laitier est choisi parmi le lait entier, le lait écrémé, le petit lait, le babeurre, le serum de beurre et ses concentrés, notamment le lait filtré sur membrane, le babeurre, la crème, le yaourt, le fromage et le quark, contenant facultativement des agents de saveur et des conservateurs.

50 3. Produit à tartiner comestible selon la revendication 1, dans lequel le pH de la phase aqueuse est compris entre 4,0 et 5,8.

55 4. Produit à tartiner selon la revendication 1, dans lequel la phase aqueuse contient 1 à 25 meq d'acide par kg.

5. Produit à tartiner comestible selon la revendication 1, dans lequel la phase aqueuse contient du lait déminéralisé et désacidifié ou un produit laitier contenant moins de 80% et, de préférence, de 0,5 à

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- 70% de la quantité d'acide et de sel qu'on trouve dans le lait ou produit laitier correspondant non déminéralisé.
- 6. Produit à tartiner comestible selon la revendication 1, dans lequel la phase aqueuse comprend :
  - 5 0 à 950, de préférence 0 à 350 mg potassium/kg
  - 0 à 500, de préférence 0 à 150 mg sodium/kg
  - 0 à 250 mg calcium/kg
  - 0 à 20 mg magnésium/kg
  - 10 0 à 800, de préférence 0 à 200 mg chlorure/kg
  - 0 à 800, de préférence 0 à 600 mg phosphore/kg (organique + minéral)
  - 0 à 1000, de préférence 0 à 400 mg citrate/kg, et
  - 0 à 10 000, de préférence 0 à 2500 mg lactate/kg.
- 7. Lait ou produit laitier déminéralisé et désacidifié selon la revendication 1, dans lequel la culture bactérienne est choisie parmi : Streptococcus lactis, Streptococcus diacetylactis, Streptococcus cremoris, Streptococcus aromaticus, Streptococcus citrophilus, Betacoccus cremoris, Leuconostoc citrovorum, Leuconostoc cremoris, Lactobacillus helveticus, Lactobacillus casei et Priopionibacterium shermanii.
- 8. Produit à tartiner comestible selon la revendication 7, dans lequel la culture bactérienne est un mélange de Streptococcus diacetylactis, Leuconostoc cremoris et Streptococcus cremoris.
- 9. Produit à tartiner comestible selon la revendication 1, dans lequel la phase aqueuse contient un composant choisi dans le groupe comprenant un agent épaississant, un agent gélifiant et un mélange 25 des agents gélifiant et épaississant.
- 10. Produit à tartiner comestible selon la revendication 9, dans lequel la phase aqueuse contient de la gélatine.
- 11. Produit à tartiner comestible selon la revendication 9, dans lequel la phase aqueuse contient de l'amidon hydraté non cristallin.
- 12. Produit à tartiner comestible selon la revendication 11, dans lequel l'amidon est choisi dans le groupe comprenant l'amidon de riz, l'amidon d'avoine, l'amidon de maïs, l'amidon de blé, le phosphate 35 diamilacé, l'adipate diamilacé et acétylé, le phosphate diamilacé hydroxypropylque et le phosphate diamilacé acétylé.
- 13. Produit à tartiner comestible selon la revendication 1, dans lequel la phase aqueuse représente de 10 à 80%, de préférence de 40 à 70% en poids du produit à tartiner total et la phase grasse représente de 40 20 à 90%, de préférence de 30 à 65% en poids du produit à tartiner total.
- 14. Produit à tartiner comestible selon la revendication 1, dans lequel la phase grasse contient du babeurre et, de préférence, un mélange de babeurre et d'une graisse végétale.
- 15. Produit à tartiner comestible selon la revendication 1, dans lequel le produit est une émulsion eau-dans-huile.

**Revendications pour l'Etat contractant suivant AT**

- 50 1. Procédé de production de la phase aqueuse d'un produit à tartiner contenant de l'eau déminéralisée et désacidifiée et une huile, caractérisé en ce que ce procédé consiste :
  - (a) à acidifier le lait ou un produit laitier par fermentation avec une culture bactérienne produisant un diacétyle ou des précurseurs de celui-ci, et
  - (b) à électrodialyser le lait ou le produit laitier pour en éliminer les matières minérales et l'acide,
- 55 pour obtenir ainsi une phase aqueuse déminéralisée et désacidifiée comprenant moins de 40 meq d'acide/kg, du diacétyle à raison de 1 à 40 mg/kg, du calcium à raison de 0 à 720 mg/kg et du magnésium à raison de 0 à 20 mg/kg.

2. Procédé selon la revendication 1, dans lequel le pH obtenu est compris entre 4,0 et 5,8.
3. Procédé selon la revendication 1, dans lequel la teneur établie en acide est comprise entre 1 et 25 meq d'acide/kg.
4. Procédé selon la revendication 1, dans lequel la teneur obtenue en acide et en sel est inférieure à 80% et, de préférence, de 0,5 à 70% de la quantité d'acide et de sel présente dans le lait ou produit laitier non déminéralisé correspondant.
5. Procédé selon la revendication 1, dans lequel la phase aqueuse comprend :
  - 0 à 950, de préférence 0 à 350 mg potassium/kg
  - 0 à 500, de préférence 0 à 150 mg sodium/kg
  - 0 à 250 mg calcium/kg
  - 0 à 20 mg magnésium/kg
10. 0 à 800, de préférence 0 à 200 mg chlorure/kg
15. 0 à 800, de préférence 0 à 600 mg phosphore/kg (organique + minéral)
- 0 à 1000, de préférence 0 à 400 mg citrate/kg, et
- 0 à 10 000, de préférence 0 à 2500 mg lactate/kg.
20. 6. Procédé selon la revendication 1, qui consiste également à faire surir le lait ou le produit laitier à l'aide d'une culture bactérienne contenant un ou plusieurs des organismes suivants : *Streptococcus lactis*, *Streptococcus diacetylactis*, *Streptococcus cremoris*, *Streptococcus aromaticus*, *Streptococcus citrophilus*, *Betacoccus cremoris*, *Leuconostoc citrovorum*, *Leuconostoc cremoris*, *Lactobacillus helveticus*, *Lactobacillus casei* et *Priopionibacterium shermanii*, de préférence un mélange de *Streptococcus diacetylactis*, *Streptococcus cremoris* et *Leuconostoc cremoris*.
25. 7. Procédé selon la revendication 6, qui consiste également à aérer le lait et le produit laitier.
8. Procédé selon la revendication 1, dans lequel on choisit le lait ou le produit laitier parmi le lait entier, le lait écrémé, le petit lait, le babeurre, le serum de beurre et ses concentrés, notamment le lait filtré sur membrane, le babeurre la crème, le yaourt, le fromage et le quark, contenant facultativement des agents de saveur et des conservateurs.
30. 9. Procédé de production d'un produit à tartiner comestible contenant de l'eau et de l'huile, caractérisé en ce qu'on exécute les stades décrits dans la revendication 1 et on émulsifie la phase aqueuse avec une phase grasse.
35. 10. Procédé selon la revendication 9, dans lequel la phase aqueuse représente de 10 à 80%, de préférence de 40 à 70% en poids du produit à tartiner total.
40. 11. Procédé selon la revendication 9, dans lequel la phase grasse contient du babeurre et, de préférence un mélange de babeurre et de graisse végétale.

#### Patentansprüche

45. Patentansprüche für folgende Vertragsstaaten: BE, CH, LI, DE, ES, FR, GB, GR, IT, NL, SE,

1. Eßbarer, Öl und Wasser enthaltender Emulsionsbrotaufstrich, umfassend eine Fettphase und eine wäßrige Phase eines pH-Wertes von nicht über 6,0, wobei die wäßrige Phase umfaßt:
  - 50. weniger als 40 Milläquivalent Säure/kg,  
Diacetyl in einer Konzentration von 4 bis 40 mg/kg,  
Calcium in einer Konzentration von 0 bis 720 mg/kg,  
Magnesium in einer Konzentration von 0 bis 20 mg/kg,
  - 55. wobei diese wäßrige Phase das Produkt ist, das erhalten wird durch:
    - a) Säuern von Milch oder einem Milchprodukt mit einer Bakterienkultur, die Diacetyl oder dessen Vorläufer produziert, und
    - b) Elektrodialysieren der Milch oder des Milchproduktes, um Mineralien und Säure daraus zu

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entfernen.

2. Eßbarer Brotaufstrich gemäß Anspruch 1, worin die Milch oder das Milchprodukt aus der Gruppe ausgewählt ist, die aus Vollmilch, Magermilch, Molke, Buttermilch, Butterserum und deren Konzentraten, einschließlich membranfiltrierter Milch, Buttermilch, Sahne, Yoghurt, Käse und Quark, besteht, die wahlweise Aromastoffe und Konservierungsmittel enthalten.
3. Eßbarer Brotaufstrich gemäß Anspruch 1, worin der pH-Wert der wäßrigen Phase im Bereich von 4,0 bis 5,8 liegt.
4. Eßbarer Brotaufstrich gemäß Anspruch 1, worin die wäßrige Phase 1 bis 25 Milliequivalent Säure/kg enthält.
5. Eßbarer Brotaufstrich gemäß Anspruch 1, worin die wäßrige Phase eine entmineralisierte, entsäuerte Milch oder ein Milchprodukt enthält, die bzw. das weniger als 80 % und vorzugsweise 0,5 bis 70 % der Menge an Säure und Salz enthält, die in der entsprechenden nicht entmineralisierten Milch oder dem Milchprodukt vorliegt.
6. Eßbarer Brotaufstrich gemäß Anspruch 1, worin die wäßrige Phase umfaßt:
  - 20 0-950 und vorzugsweise 0-350 mg Kalium/kg,
  - 0-500 und vorzugsweise 0-150 mg Natrium/kg,
  - 0-250 mg Calcium/kg,
  - 0-20 mg Magnesium/kg,
  - 25 0-800 und vorzugsweise 0-200 mg Chlorid/kg,
  - 0-800 und vorzugsweise 0-600 mg Phosphor/kg (organisch + anorganisch),
  - 0-1000 und vorzugsweise 0-400 mg Citrat/kg und
  - 0-10000 und vorzugweise 0-2500 mg Lactat/kg.
7. Entmineralisierte und entsäuerte Milch oder ein derartiges Milchprodukt gemäß Anspruch 1, worin die Bakterienkultur aus *Streptococcus lactis*, *Streptococcus diacetylactis*, *Streptococcus cremoris*, *Streptococcus aromaticus*, *Streptococcus citrophilus*, *Bacillus cremoris*, *Leuconostoc citrovorum*, *Leuconostoc cremoris*, *Lactobacillus helveticus*, *Lactobacillus casei* und *Propionibacterium shermanii* ausgewählt ist.
8. Eßbarer Brotaufstrich gemäß Anspruch 7, worin die Bakterienkultur eine Mischung aus *Streptococcus diacetylactis*, *Leuconostoc cremoris* und *Streptococcus cremoris* ist.
9. Eßbarer Brotaufstrich gemäß Anspruch 1, worin die wäßrige Phase eine Komponente enthält, ausgewählt aus der Gruppe, die ein Verdickungsmittel, ein Geliermittel und eine Mischung sowohl eines Gelierals auch eines Verdickungsmittels umfaßt.
10. Eßbarer Brotaufstrich gemäß Anspruch 9, worin die wäßrige Phase Gelatine enthält.
11. Eßbarer Brotaufstrich gemäß Anspruch 9, worin die wäßrige Phase nichtkristalline hydratisierte Stärke enthält.
12. Eßbarer Brotaufstrich gemäß Anspruch 11, worin die Stärke aus der Gruppe ausgewählt ist, die aus Reisstärke, Haferstärke, Maisstärke, Weizenstärke, Distärkephosphat, acetyliertem Distärkeadipat, Hydroxypropylstärkephosphat und acetyliertem Distärkephosphat besteht.
13. Eßbarer Brotaufstrich gemäß Anspruch 1, worin die wäßrige Phase 10 bis 80 %, vorzugsweise 40 bis 70 Gew.-%, des gesamten Brotaufstriches ausmacht und die Fettphase 20 bis 90%, vorzugsweise 30 bis 65 Gew.-%, des gesamten Brotaufstriches ausmacht.
14. Eßbarer Brotaufstrich gemäß Anspruch 1, worin die Fettphase Butterfett enthält und vorzugsweise eine Mischung aus Butterfett und einem pflanzlichen Fett ist.

15. Eßbarer Brotaufstrich gemäß Anspruch 1, der aus einer Wasser-in-Öl-Emulsion besteht.

**Patentansprüche für folgenden Vertragsstaat: AT**

5 1. Verfahren zur Herstellung der wässrigen Phase eines entmineralisierten, entsäuerten, Wasser und Öl  
enthaltenden Brotaufstrichs, dadurch gekennzeichnet, daß das Verfahren die Schritte umfaßt:  
a) Ansäuern von Milch oder einem Milchprodukt durch Fermentieren mit einer Bakterienkultur, die  
Diacetyl oder dessen Vorläufer produzieren kann, und  
b) Elektrodialysieren der Milch oder des Milchproduktes zur Entfernung von Mineralien und Säure  
daraus,

um so eine entmineralisierte und entsäuerte wässrige Phase zu erhalten, die weniger als 40 Milliequivalent Säure/kg, Diacetyl in einer Konzentration von 1 bis 40 mg/kg, Calcium in einer Konzentration von 0 bis 720 mg/kg und Magnesium in einer Konzentration von 0 bis 20 mg/kg umfaßt.

15 2. Verfahren gemäß Anspruch 1, worin der erzielte pH-Wert im Bereich von 4,0 bis 5,8 liegt.  
3. Verfahren gemäß Anspruch 1, worin der erzielte Säuregehalt im Bereich von 1 bis 25 Milliequivalent Säure/kg liegt.  
20 4. Verfahren gemäß Anspruch 1, worin der erzielte Säure- und Salzgehalt weniger als 80 % und vorzugsweise 0,5 bis 70 % der Menge an Säure und Salz beträgt, die in der bzw. dem entsprechenden nicht entmineralisierten Milch oder Milchprodukt vorliegt.  
25 5. Verfahren gemäß Anspruch 1, worin die wässrige Phase umfaßt:

0-950 und vorzugsweise 0-350 mg Kalium/kg,  
0-500 und vorzugsweise 0-150 mg Natrium/kg,  
0-250 mg Calcium/kg,  
30 0-20 mg Magnesium/kg,  
0-800 und vorzugsweise 0-200 mg Chlorid/kg,  
0-800 und vorzugsweise 0-600 mg Phosphor/kg (organisch + anorganisch),  
0-1000 und vorzugsweise 0-400 mg Citrat/kg und  
0-10000 und vorzugsweise 0-2500 mg Lactat/kg.

35 6. Verfahren gemäß Anspruch 1, das ferner den Schritt des Säuerns der Milch oder des Milchproduktes mit einer Bakterienkultur umfaßt, die ein oder mehrere der Bakterien Streptococcus lactis, Streptococcus diacetylactis, Streptococcus cremoris, Streptococcus aromaticus, Streptococcus citrophilus, Beta-coccus cremoris, Leuconostoc citrovorum, Leuconostoc cremoris, Lactobacillus helveticus, Lactobacillus casei und Propionibacterium shermanii, vorzugsweise eine Mischung von Streptococcus diacetylactis, Streptococcus cremoris und Leuconostoc cremoris, enthält.

45 7. Verfahren gemäß Anspruch 6, das ferner den Schritt des Belüftens der Milch oder des Milchproduktes umfaßt.

8. Verfahren gemäß Anspruch 1, worin die Milch oder das Milchprodukt aus der Gruppe ausgewählt ist, die Vollmilch, Magermilch, Molke, Buttermilch, Butterserum und deren Konzentrate, einschließlich membranfiltrierter Milch, Buttermilch, Sahne, Yoghurt, Käse und Quark, die wahlweise Aromastoffe und Konservierungsmittel enthalten, umfaßt.  
50 9. Verfahren zur Herstellung eines eßbaren, Wasser und Öl enthaltenden Brotaufstriches, dadurch gekennzeichnet, daß das Verfahren die Verfahrensschritte von Anspruch 1 und das Emulgieren der wässrigen Phase mit einer Fettschicht einschließt.  
55 10. Verfahren gemäß Anspruch 9, in welchem die wässrige Phase 10 bis 80 %, vorzugsweise 40 bis 70 Gew.-%, des gesamten Brotaufstriches ausmacht.  
11. Verfahren gemäß Anspruch 9, in welchem die Fettschicht Butterfett enthält und vorzugsweise eine

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Mischung aus Butterfett und einem pflanzlichen Fett ist.

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